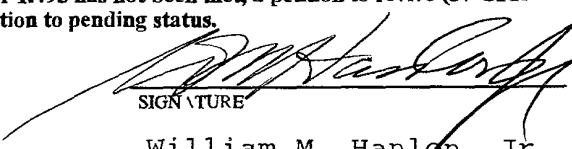


FORM PTO-1390 (REV. 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER <u>VWF-514-A</u>
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 097830528
INTERNATIONAL APPLICATION NO. PCT/FR99/02619	INTERNATIONAL FILING DATE 27 October 1999	PRIORITY DATE CLAIMED 28 October 1998	
TITLE OF INVENTION WIPER ARM SHAPED AS AN AERODYNAMIC DEFLECTOR			
APPLICANT(S) FOR DO/EO/US Sebastien Jallet and Jean-Michael Jarasson			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</p> <p>4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <p>a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</p> <p>b. <input type="checkbox"/> has been communicated by the International Bureau.</p> <p>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</p> <p>6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).</p> <p>a. <input checked="" type="checkbox"/> is attached hereto.</p> <p>b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</p> <p>7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p>a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</p> <p>b. <input type="checkbox"/> have been communicated by the International Bureau.</p> <p>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p>d. <input type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p>			
Items 11 to 20 below concern document(s) or information included:			
<p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input checked="" type="checkbox"/> A FIRST preliminary amendment.</p> <p>14. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>15. <input checked="" type="checkbox"/> A substitute specification.</p> <p>16. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.</p> <p>18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</p> <p>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</p> <p>20. <input checked="" type="checkbox"/> Other items or information: Red-Line Specification</p>			

U.S. APPLICATION NO. 09/830528 <small>(If known, see 37 CFR 1.53)</small>		INTERNATIONAL APPLICATION NO. PCT/FR99/02619		ATTORNEY'S DOCKET NUMBER VWF-514-A																										
21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1)-(5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				CALCULATIONS PTO USE ONLY																										
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$ 860																										
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">CLAIMS</th> <th style="width: 20%;">NUMBER FILED</th> <th style="width: 20%;">NUMBER EXTRA</th> <th style="width: 20%;">RATE</th> <th style="width: 20%;">\$</th> </tr> </thead> <tbody> <tr> <td>Total claims</td> <td>9 - 20 =</td> <td></td> <td>x \$18.00</td> <td></td> </tr> <tr> <td>Independent claims</td> <td>1 - 3 =</td> <td></td> <td>x \$80.00</td> <td></td> </tr> <tr> <td colspan="4">MULTIPLE DEPENDENT CLAIM(S) (if applicable)</td> <td>+ \$270.00</td> </tr> <tr> <td colspan="4" style="text-align: right;">TOTAL OF ABOVE CALCULATIONS =</td> <td>\$ 860</td> </tr> </tbody> </table>				CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	Total claims	9 - 20 =		x \$18.00		Independent claims	1 - 3 =		x \$80.00		MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+ \$270.00	TOTAL OF ABOVE CALCULATIONS =				\$ 860	\$ 0	
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Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$ 40																										
TOTAL FEES ENCLOSED =				\$ 900																										
				Amount to be refunded: \$																										
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a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>900.00</u> to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>25-0115</u> duplicate copy of this sheet is enclosed. d. <input type="checkbox"/> Fees are to be charged to a credit card. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.																														
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.																														
SEND ALL CORRESPONDENCE TO: Andrew R. Basile YOUNG & BASILE, PC 3001 West Big Beaver Road Suite 624 Troy, MI 48084																														
				SIGNATURE  <u>William M. Hanlon, Jr.</u> NAME <u>28422</u> REGISTRATION NUMBER																										

09/830528

JC19 Rec'd PCT/PTO 26 APR 2001

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EXPRESS MAIL LABEL NO.:

EL845187829US

Sir:

Enclosed please find a national stage application for U.S. Patent under 35
 CFR §371 as identified below.

Inventor: Sebastien Jallet and Jean-Michael Jarasson
 Invention: **WIPER ARM SHAPED AS AN AERODYNAMIC DEFLECTOR**

and including: Postcard; Transmittal Letter; Combined Declaration and Power
 of Attorney; Preliminary Amendment; Substitute Specification; Red-Lined Specification;
 English Language Translation; Copy of the International Application; Information Disclosure
 Statement including Form PTO-1449 and the cited references; Recordation Form Cover
 Sheet; Assignment

Filing Fee:	\$860.00
Recordation Fee:	\$ 40.00
Total	\$900.00

Please charge any deficiency or credit any excess in the enclosed fees to
 Deposit Account No. 25-0115.

Respectfully submitted,

YOUNG, BASILE, HANLON, MacFARLANE, WOOD &
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William M. Hanlon, Jr.
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WMH/jao
 Enclosures

Our Reference: VWF-514-A

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Sebastien Jallet and Jean-Michael Jarasson
Serial Number: Unknown
Filing Date: Concurrent
Examiner/Art Group Unit: Unknown/Unknown
Title: WIPER ARM SHAPED AS AN
AERODYNAMIC DEFLECTOR

PRELIMINARY AMENDMENT

Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

Prior to initial examination, please amend the above-identified patent application as indicated below.

In the specification:

After the claims, insert a new page containing:

ABSTRACT

[0046] The invention concerns a wiper arm comprising a body extending longitudinally from its rear driving end towards its front end which bears a wiper blade, and wherein, in cross section, at least a section of the arm body has an upturned U-shaped cross section defined by two wings mutually connected by an upper back and extending towards the surface to be wiped, consisting of a downstream wing remaining substantially perpendicular to the back and an inclined upstream wing forming an acute angle relative to a median plane parallel to the downstream wing to form an aerodynamic deflector integrated in the wiper arm which, by the action of a relative downwind direction, tends to urge the wiper arm towards the surface to be wiped. The upstream wing has a substantially planar or curved surface and the value of said angle ranges between 30° and 45°.

In the claims:

Cancel claims 1 - 9 and substitute new claims 10 - 18 therefore:

1 10. A wiper arm of the type containing an arm body that
2 extends longitudinally from a rear driving end towards a front end that bears a
3 wiper arm, and of the type in which, in cross section, at least a section of the arm
4 body has an upturned U-shaped cross-section defined by two upstream and
5 downstream wings mutually connected by an upper back extending towards a
6 surface to be wiped, consisting of a downstream wing remaining substantially
7 perpendicular to the upper back and the inclined upstream wing forming an
8 acute angle relative to a median plane parallel to the downstream wing to form
9 an aerodynamic deflector integrated in the wiper arm which, by the action of a
10 relative downwind direction, tends to urge the wiper arm towards the surface to
11 be wiped, characterized by the upstream wing presenting a surface, the curve of
12 which varies progressively from one end to the other of the wiper arm body, and
13 of which the value of the acute angle ranges between 30° and 45°.

1 11. The wiper arm according to claim 10, characterized by the
2 upstream wing presenting a substantially planar surface.

1 12. The wiper arm according to claim 10, characterized by the
2 value of the acute angle ranging between 32° and 35°.

3 13. The wiper arm according to claim 10, characterized by a
4 height of the downstream wing being lower than a height of the upstream wing,
5 and that the ratio of the two heights ranges between 0.65 and 0.85.

1 14. The wiper arm according to claim 10, characterized by, in
2 cross-section, the value of an angle between a straight line passing by lower
3 edges of the downstream and upstream wings and the tangent to the upper
4 back at the level of the median plane, ranging between 7° and 16°.

1 15. The wiper arm according to claim 10, characterized by at
2 least one of the upstream and downstream wings containing a longitudinal
3 reinforcement rib.

REMARKS

After entry of this amendment, claims 1 - 9 have been canceled. New claims 10 - 18 have been substituted therefore in this application.

A handwritten, corrected copy of the specification is enclosed showing the changes which have been made to the specification as required by Section 608.01(Q) and 714.20(1) of the Manual of Patent Examining Procedure. The Substitute Specification filed herewith has been amended to utilize idiomatic English, correct minor typographical and grammatical errors and to conform the application to current United States patent practice. The Substitute Specification includes no new subject matter; but does include the same changes handwritten in red in the attached, corrected, original specification. Entry of the Substitute Specification is respectfully requested.

The claims have been canceled and new claims added in substitution therefor to remove multiple dependency and to remove reference numbers as well as to conform the claims to idiomatic English. The new claims are not submitted to overcome any known art.

It is submitted that this Amendment has antecedent basis in the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Consideration of the application as amended is requested.

Respectfully submitted,

YOUNG, BASILE, HANLON, MacFARLANE, WOOD
& HELMHOLDT, P.C.



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Dated: April 26, 2001
WMH/dge/jo

SUBSTITUTE SPECIFICATION

VWF -514-A

PATENT

WIPER ARM SHAPED AS AN AERODYNAMIC DEFLECTOR

BACKGROUND

[0001] The present invention concerns a wiper arm for an automobile.

[0002] More specifically, the invention concerns a wiper arm of the type comprising a body extending longitudinally from its rear driving end towards its front end which bears a wiper blade, and wherein, in cross-section, at least a section of the arm body has an upturned U-shaped cross-section defined by two wings mutually connected by an upper back and extending towards the surface to be wiped, consisting of a downstream wing remaining substantially perpendicular to the back and an inclined upstream wing forming an acute angle relative to a median plan parallel to the downstream wing to form an aerodynamic deflector integrated in the wiper arm which, by the action of a relative downwind direction, tends to urge the wiper arm towards the surface to be wiped.

[0003] An example of such a wiper arm is described and represented in document DE-A-3.343.318 in which the wiper arm is created from one piece in serrated, bent sheet metal. In the front portion of the aerodynamic deflector, the upstream wing is globally inclined and curved with its concavity oriented towards the flux of air corresponding to the relative wind direction applied to the wiper arm while wiping the windshield, by taking into account the forward movement of the vehicle.

[0004] The goal of this invention is to propose a wiper arm of this type which is created in order to improve the performance and rigidity, and to simplify its fabrication.

SUMMARY OF THE INVENTION

[0005] With this goal in mind, the invention proposes a wiper arm of the type mentioned above, characterized by the upstream wing presents a

substantially curved surface, and the value of the acute angle of the inclined upstream wing ranges between 30° and 45°.

- [0006] According to other characteristics of the invention:
- [0007] the value of the inclined acute angle ranges between 32° and 35°;
- [0008] the height of the downstream wing is below the height of the upstream wing, and the ratio of the two heights ranges between 0.65 and 0.85;
- [0009] in cross section, the value of the angle between the straight line passing by the lower edges of the downstream and upstream wings and the tangent to the upper back at the level of the median plane ranges between 7° and 16°;
- [0010] at least one of the wings, notably the upstream wing, contains a longitudinal reinforcement rib;
- [0011] at least one of the wings, notably the downstream wing, contains an interior reinforcement fold;
- [0012] the acute inclined angle of the upstream wing varies progressively in a manner such that the two wings are parallel at the rear and front ends of the body of the wiper arm;
- [0013] the wiper arm is created in one piece of serrated and bent sheet metal.

BRIEF DESCRIPTION OF THE DRAWING

- [0014] The other characteristics and advantages of the invention will appear in the reading of the detailed description which follows, for the comprehension of which one will refer to the attached drawings in which:
- [0015] Fig. 1 is an elevated lateral view of a wiper arm that conforms to the specifications of the invention;
- [0016] Fig. 2 is a top view of the wiper arm in Fig. 2;
- [0017] Figs. 3 to 7 are cross section views according to lines S1, S2, S3, S5, and S6 in Figs. 1 and 2;
- [0018] Fig. 8 is a view similar to Fig. 4 which illustrates a variation in production; and

[0019] Fig. 9 is a diagram illustrating the relative dimensions of the wiper arm and the values of the aerodynamic lift and rigidity of the wiper arm.

DETAILED DESCRIPTION

[0020] In the description that is going to follow of an example of production, the terms "horizontal", "vertical", "upper", "lower", etc. will be used in a non-limiting fashion in order to facilitate the comprehension of the description and in reference to the Figs.

[0021] In this example, the upstream wing presents a flat surface. In other methods of realization, the upstream wing presents a surface having, in cross-section, a curve, specifically a weak curve, this curve being able to vary from one end to the other of the wiper arm.

[0022] A wiper arm 10 is represented on Figs. 1 to 7 is realized in the shape of only one piece of serrated and bent sheet metal.

[0023] The wiper arm 10 extends longitudinally from its rear end 12 to its front end 14.

[0024] The rear end 12 is created in order to allow the driving of the wiper arm around a vertical driving X-X axis and contains, for this effect, an aperture 16 allowing the passage of the upper free end (not represented) by a drive shaft for alternating or linear sweeping of the windshield.

[0025] The front longitudinal end 14 is formed in order to make up an articulation end for a wiper arm (not represented) that is mounted for pivoting globally around a horizontal axis Y-Y.

[0026] According to a generally known method of conception, the wiper arm 10 presents an upturned U-shaped cross-section.

[0027] Thus, it contains two vertical and parallel lateral wings 18 and 20 (see Fig. 3) that are linked between them by a horizontal upper back 22 which has a slightly curved profile with its convexity oriented vertically towards the top. The wing reach from the upper back 22 in the direction of the surface to be wiped (not represented).

[0028] In relation to the flux of air F (see Fig. 4) that corresponds to the principal direction of the vent relative to which the wiper arm is submissive

while the wiping movement and the forward movement of the vehicle, one distinguishes the downstream wing 18 and the upstream wing 20.

[0029] As one can see by considering Fig. 2, the wiper arm 10 is not rectilinear, but it presents a generally curved shape.

[0030] In all of the transversal sections of the arm, the downstream wing 18 is notably flat and vertical.

[0031] Leaving from the rear longitudinal end 12 of the wiper arm 10, to the left in consideration of Figs. 1 and 2, one notices that the upstream wing 20 is also notably flat and vertical, that is to say, parallel to the downstream wing 18 until one point P1, situated between sections S1 and S2, from which the upstream wing 20 is flat but is inclined in relation to a vertical median plane V, parallel to the downstream wing 18, by forming an acute angle A in relation to this plane, the inclination being such that the lower side 24 of the upstream wing 20 is more spread out from the vertical median plane V than its upper edge 28.

[0032] In addition, from the point P1, the lower edge 24 of the upstream wing 20 is situated vertically lower than the edge 28 of the downstream wing 18 while, until the point P1, the upstream 20 and the downstream wings 18 have the same height.

[0033] As one moves along the wiper arm from the rear to the front from point P1, one reaches the point P2 situated notably to the right of section S5 from which, as one can see in Fig. 6, the upstream 20 and downstream 18 wings are once again planar, vertical, and parallel to each other and of equal heights.

[0034] Near the rear end 12, the downstream 18 and upstream 20 wings each contain a hole 30, 32 aligned transversally in the plane of section S1 for the passage of an articulation rod on the axis Z-Z notably horizontal and perpendicular to the axis X-X.

[0035] From the point P2, and thus from the plane of section S5, the arm extends longitudinally towards the front from its front end formed as illustrated in Fig. 7 with the lateral downstream 18 and upstream 20 wings

that are once again connected from the vertical median plane of this end front portion in two central adjacent wings.

[0036] Conforming to one of the characteristics of the invention, the value of the acute angle A of the inclination of the upstream wing 20 varies the length of the wiper arm 10.

[0037] More precisely, it is equal to approximately 23° to the right of section S2 (see Fig. 4), then it augments in order to be at its maximum between section S3 and S4.

[0038] In effect, the longitudinal portion of the wiper arm between sections S3 and S4 make up the principal section forming an aerodynamic deflector for which the aerodynamic global lift applies to the wiper arm 10 is negative, the value of angle A ranging between 30° and 45° , and preferably between 32° and 35° , for the length of the portion.

[0039] The value of the angle A decreases progressively towards the front end from section S4 in order to be brought back to 0° to the right of section S5.

[0040] Conforming to another characteristic of the invention, the ratio between the height H1 of the downstream wing 18 and the height H2 of the upstream wing 20, while this latter is inclined, ranging between 0.65 and 0.85.

[0041] In the same manner, the acute angle B, formed by the straight line D, passes by the lower sides 28 and 24 of the downstream wing 18 and the upstream wing 20, in relation to the horizontal passing by the lower edge 28, ranges between 7° and 16° for the length of the section forming the aerodynamic deflector.

[0042] The choice of these parameters of such sizes allows, in the zone corresponding to the situation in which the aerodynamic lift is negative, that is to say, while the wiper arm is pressed vertically against the windshield and while it does not lift under the flux of air, in order to not reduce by too much the moment of bending 1 of the arm in this zone, the moment of bending 1

being reduced to the maximum of 30% in relation to its maximum value marked 10 being displayed on the diagram of Fig. 9.

[0043] In this zone, in which the ratio of the heights ranges between 0.65 and 0.85, there is not any twisting in the successive transversal sections of the working arm.

[0044] Thanks to the specifications of the invention, one thus obtains an optimal compromise between the reduction of the twisted aerodynamic (drag, but above all lift) and the increase in the rigidity of a wiper arm created in just one piece.

[0045] In order to further increase this rigidity, it is possible (see Fig. 8) to form a longitudinal rib 34 at least in the upstream wing 20 and to reinforce the downstream wing 18 by an interior fold 36 of the sheet metal from the lower edge 28 and vertically towards the top.

What is Claimed Is:

1. Wiper arm (10) of the type containing an arm body that extends longitudinally from its rear driving end (12) towards its front end (14) that bears a wiper arm, and of the type in which, in cross section, at least a section of the of the arm body has an upturned U-shaped cross-section defined by two wings (18, 20) mutually connected by an upper back (22) extending towards the surface to be wiped, consisting of a downstream wing (18) remaining substantially perpendicular to the back (22) and an inclined upstream wing (20) forming an acute angle (A) relative to a median plane (V) parallel to the downstream wing (18) to form an aerodynamic deflector integrated in the wiper arm which, by the action of a relative downwind direction (F), tends to urge the wiper arm (10) towards the surface to be wiped, characterized by the upstream wing (20) presents a surface, the curve of which varies progressively from one end to the other of the wiper arm body, and of which the value of the acute angle (A) ranges between 30° and 45°.

2. Wiper arm according to claim 1, characterized by the upstream wing presenting a substantially planar surface.

3. Wiper arm according to one of the preceding claims, characterized by the value of the acute angle (A) ranging between 32° and 35°.

4. Wiper arm according to one of the preceding claims, characterized by the height (H1) of the downstream wing (18) being lower than the height (H2) of the upstream wing (20), and that the ration (H1/H2) of the two heights ranges between 0.65 and 0.85.

5. Wiper arm according to one of the preceding claims, characterized by, in cross-section, the value of the angle (B) between the straight line (D) passing by the lower edges (28, 24) of the downstream (18) and upstream (20) wings and the tangent to the upper back (22) at the level of the median plane (V), ranging between 7° and 16°.

6. Wiper arm according to one of the preceding claims, characterized by at least one of the wings, notably the upstream wing (20), containing a longitudinal reinforcement rib (34).

7. Wiper arm according to one of the preceding claims, characterized by at least one of the wings, notably the downstream wing (18), containing in interior reinforcement fold (36).

8. Wiper arm according to one of the preceding claims, characterized by the inclined acute angle (A) of the upstream wing (20) varying progressively in such a way that the two wings (18, 20) are parallel at the rear and front ends of the wiper arm body.

9. Wiper arm according to one of the preceding claims, characterized by being produced in one piece of serrated, bent sheet metal.

VWF -514-A

WIPER ARM SHAPED AS AN AERODYNAMIC DEFLECTOR

The present invention concerns a wiper arm for a vehicular automobile.

5 More specifically, the invention concerns a wiper arm of the type comprising a body extending longitudinally from its rear driving end towards its front end which bears a wiper blade, and wherein, in cross-section, at least a section of the arm body has an upturned U-shaped cross-section defined by two wings mutually connected by an upper back and extending towards the surface to
10 be wiped, consisting of a downstream wing remaining substantially perpendicular to the back and an inclined upstream wing forming an acute angle relative to a median plan parallel to the downstream wing to form an aerodynamic deflector integrated in the wiper arm which, by the action of a relative downwind direction, tends to urge the wiper arm towards the surface to be wiped.

15 An example of such a wiper arm is described and represented in document DE-A-3.343.318 in which the wiper arm is created from by one piece in serrated, bent sheet metal. In the front portion of the aerodynamic deflector, the upstream wing is globally inclined and curved with its concavity oriented towards the flux of air corresponding to the relative wind direction applied to the wiper arm
20 while wiping the windshield, by taking into account the forward movement of the vehicle.

The goal of this invention is to propose a wiper arm of this type which is created in order to improve the performance and rigidity, and to simplify its fabrication.

25 With this goal in mind, the invention proposes a wiper arm of the type mentioned above, characterized by the upstream wing presents a substantially curved surface, and the value of the acute angle of the inclined upstream wing ranges between 30° and 45°.

According to other characteristics of the invention:

the value of the inclined acute angle ranges between 32° and 35° ;

the height of the downstream wing is below the height of the upstream wing, and the ratio of the two heights ranges between 0.65 and 0.85;

in cross section, the value of the angle between the straight line passing by the lower edges of the downstream and upstream wings and the tangent to the upper back at the level of the median plane ranges between 7° and 16° ;

at least one of the wings, notably the upstream wing, contains a longitudinal reinforcement rib

at least one of the wings, notably the downstream wing, contains an interior reinforcement fold

the acute inclined angle of the upstream wing varies progressively in a manner such that the two wings are parallel at the rear and front ends of the body of the wiper arm;

the wiper arm is created in one piece in serrated and bent sheet metal.

The other characteristics and advantages of the invention will appear in the reading of the detailed description which follows, for the comprehension of which one will refer to the attached drawings in which:

figure 1 is an elevated lateral view of a wiper arm that conforms to the specifications of the invention;

figure 2 is a top view of the wiper arm in figure 2;

figures 3 to 7 are cross section views according to lines S1, S2, S3, S5, and S6 in figures 1 and 2;

figure 8 is a view similar to figure 4 which illustrates a variation of production;

figure 9 is a diagram illustrating the relative dimensions of the wiper arm and the values of the aerodynamic lift and rigidity of the wiper arm.

In the description that is going to follow an example of production, the terms "horizontal", "vertical", "upper", "lower", etc. will be used in a non-

limiting fashion in order to facilitate the comprehension of the description and in reference to the figures.

In this example, the upstream wing presents a flat surface. In other methods of realization, the upstream wing presents a surface having, in cross-
 5 section, a curve, specifically a weak curve, this curve being able to vary from one end to the other of the wiper arm.

A wiper arm 10 is represented on figures 1 to 7 is realized in the shape of only one piece of serrated and bent sheet metal.

The wiper arm 10 extends longitudinally from its rear end 12 to its
 10 front end 14.

The rear end 12 is created in order to allow the driving of the wiper arm around a vertical driving X-X axis and contains, for this effect, a hole 16 allowing the passage of the upper free end (not represented) by a drive shaft of alternating or linear sweeping of the windshield.

The front longitudinal end 14 is formed in order to make up an articulation end for a wiper arm (not represented) that is mounted pivoting globally around a horizontal axis Y-Y.
 15

According to a generally known method of conception, the wiper arm 10 presents an upturned U-shaped cross-section.

Thus, it contains two vertical and parallel lateral wings 18 and 20
 20 (see figure 3) that are linked between them by a horizontal upper back 22 which has a slightly curved profile with its convexity oriented vertically towards the top. The wing reach from the upper back 22 in the direction of the surface to be wiped (not represented.)

In relation to the flux of air F (see figure 4) that corresponds to the principal direction of the vent relative to which the wiper arm is submissive while the wiping movement and the forward movement of the vehicle, one distinguishes the downstream wing 18 and the upstream wing 20.
 25

As one can see by considering figure 2, the wiper arm 10 isn't
 30 rectilinear but it presents a generally curved shape.

In all of the transversal sections of the arm, the downstream wing 18 is notably flat and vertical.

Leaving from the rear longitudinal end 12 of the wiper arm 10, to the left in consideration of figures 1 and 2, one notices that the upstream wing 20 is also notably flat and vertical, that is to say parallel to the downstream wing 18 until one point P1, situated between sections S1 and S2, from which the upstream wing 20 is flat but is inclined in relation to a vertical median plane V, parallel to the downstream wing 18, by forming an acute angle A in relation to this plane, the inclination being such that the lower side 24 of the upstream wing 20 is more spread out from the vertical median plane V than its upper edge 28.

In addition, from the point P1, the lower edge 24 of the upstream wing 20 is situated vertically lower than the edge 28 of the downstream wing 18 while, until the point P1, the upstream 20 and the downstream wings 18 have the same height.

As one moves along the wiper arm, from the rear to the front from point P1, one reaches the point P2 situated notably to the right of section S5 from which, as one can see in figure 6, the upstream 20 and downstream 18 wings are once again planar, vertical, and parallel to each other and of equal heights.

Near the rear end 12, the downstream 18 and upstream 20 wings each contain a hole 30, 32 aligned transversally in the plane of section S1 for the passage of an articulation rod on the axis Z-Z notably horizontal and perpendicular to the axis X-X.

From the point P2, and thus from the plane of section S5, the arm extends longitudinally towards the front from its front end formed as it is illustrated in figure 7 with the lateral downstream 18 and upstream 20 wings that are once again connected from the vertical median plane of this end front portion in two central adjacent wings.

Conforming to one of the characteristics of the invention, the value of the acute angle A of the inclination of the upstream wing 20 varies the length of the wiper arm 10.

More precisely, it is equal to approximately 23° to the right of section S2 (see figure 4), then it augments in order to be at its maximum between section S3 and S4.

In effect, the longitudinal portion of the wiper arm between sections S3 and S4 make up the principal section forming an aerodynamic deflector for which the aerodynamic global lift applies to the wiper arm 10 is negative, the value of angle A ranging between 30° and 45° , and preferably between 32° and 35° , the length of the portion.

The value of the angle A decreases progressively towards the front end from section S4 in order to be brought back to 0° to the right of section S5.

Conforming to another characteristic of the invention, the ratio between the height H1 of the downstream wing 18 and the height H2 of the upstream wing 20, while this latter is inclined, ranging between 0.65 and 0.85.

In the same manner, the acute angle B, formed by the straight line D, passes by the lower sides 28 and 24 the downstream wing 18 and the upstream wing 20, in relation to the horizontal passing by the lower edge 28, ranges between 7° and 16° the length of the section forming the aerodynamic deflector.

The choice of these parameters of such sizes allows, in the zone corresponding to the situation in which the aerodynamic lift is negative, that is to say while the wiper arm is pressed vertically against the windshield and while it doesn't lift under the flux of air, in order to not reduce by too much the moment of bending 1 of the arm in this zone, the moment of bending 1 being reduced to the maximum of 30% in relation to its maximum value marked 10 being displayed on the diagram of figure 9.

In this zone, in which the ratio of the heights ranges between 0.65 and 0.85, there isn't any twisting in the successive transversal sections of the working arm.

Thanks to the specifications of the invention, one thus obtains an optimal compromise between the reduction of the twisted aerodynamic (drag, but above all lift) and the increase in the rigidity of a wiper arm created in just one piece.

In order to further increase this rigidity, it is possible (see figure 8) to form a longitudinal rib 34 at least in the upstream wing 20 and to reinforce the downstream wing 18 by an interior fold 36 of the sheet metal from the lower edge 28 and vertically towards the top.

Claims

1. Wiper arm (10) of the type containing an arm body that extends longitudinally from its rear driving end (12) towards its front end (14) that bears a wiper arm, and of the type in which, in cross section, at least a section of the of the arm body has an upturned U-shaped cross-section defined by two wings (18, 20) mutually connected by an upper back (22) extending towards the surface to be wiped, consisting of a downstream wing (18) remaining substantially perpendicular to the back (22) and an inclined upstream wing (20) forming an acute angle (A) relative to a median plane (V) parallel to the downstream wing (18) to form an aerodynamic deflector integrated in the wiper arm which, by the action of a relative downwind direction (F), tends to urge the wiper arm (10) towards the surface to be wiped, characterized by the upstream wing (20) presents a surface, the curve of which varies progressively from one end to the other of the wiper arm body, and of which the value of the acute angle (A) ranges between 30° and 45°.

2. Wiper arm according to claim 1, characterized by the upstream wing presenting a substantially planar surface.

3. Wiper arm according to one of the preceding claims, characterized by the value of the acute angle (A) ranging between 32° and 35°.

4. Wiper arm according to one of the preceding claims, characterized by the height (H1) of the downstream wing (18) being lower than the height (H2) of the upstream wing (20), and that the ration (H1/H2) of the two heights ranges between 0.65 and 0.85.

5. Wiper arm according to one of the preceding claims, characterized by, in cross-section, the value of the angle (B) between the straight line (D) passing by the lower edges (28, 24) of the downstream (18) and upstream

(20) wings and the tangent to the upper back (22) at the level of the median plane (V), ranging between 7° and 16° .

5 6. Wiper arm according to one of the preceding claims,
characterized by at least one of the wings, notably the upstream wing (20),
containing a longitudinal reinforcement rib (34).

 7. Wiper arm according to one of the preceding claims,
characterized by at least one of the wings, notably the downstream wing (18),
containing in interior reinforcement fold (36).

10 8. Wiper arm according to one of the preceding claims,
characterized by the inclined acute angle (A) of the upstream wing (20) varying
progressively in such a way that the two wings (18, 20) are parallel at the rear and
front ends of the wiper arm body.

 9. Wiper arm according to one of the preceding claims,
characterized by being produced in one piece of serrated, bent sheet metal.

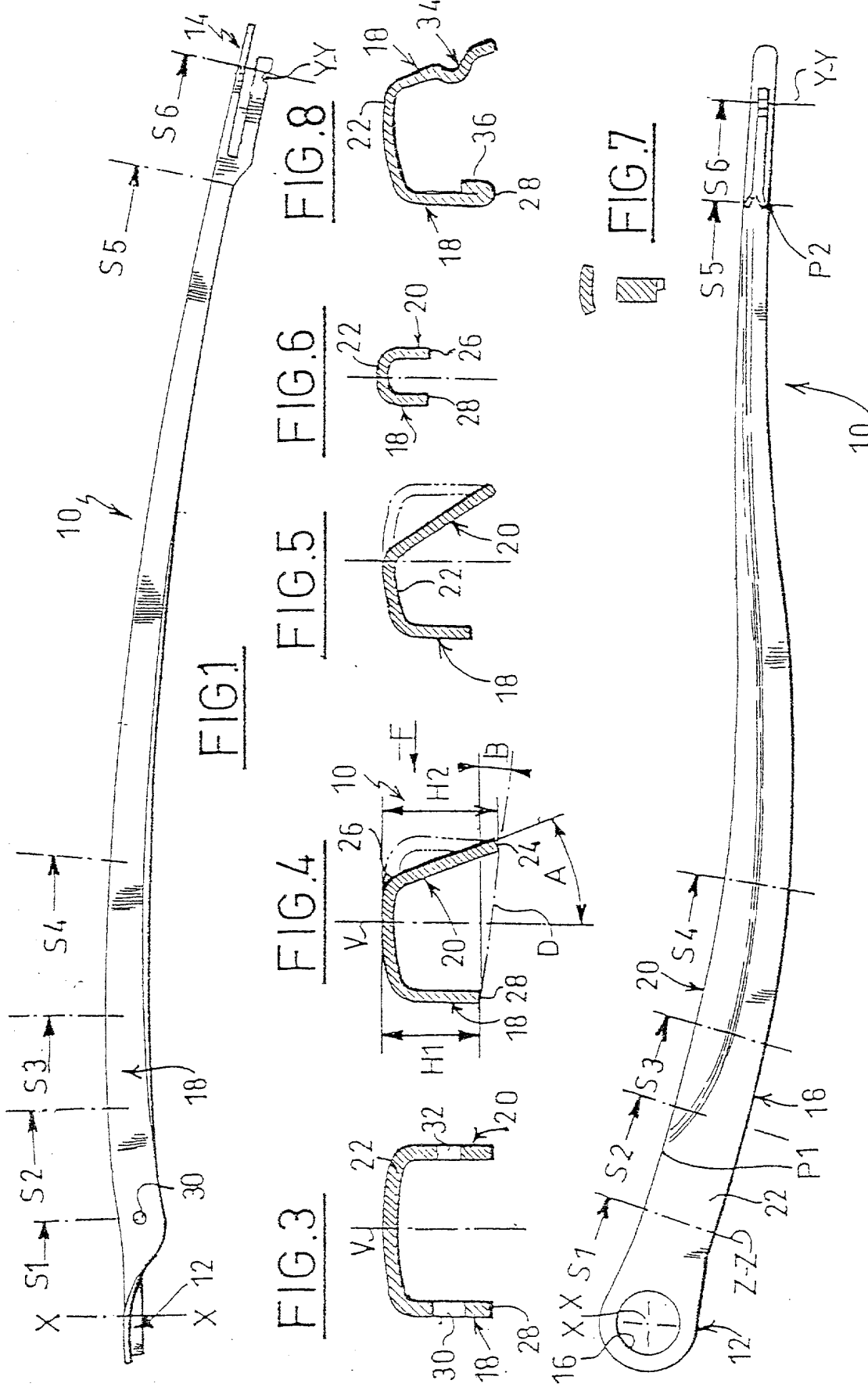
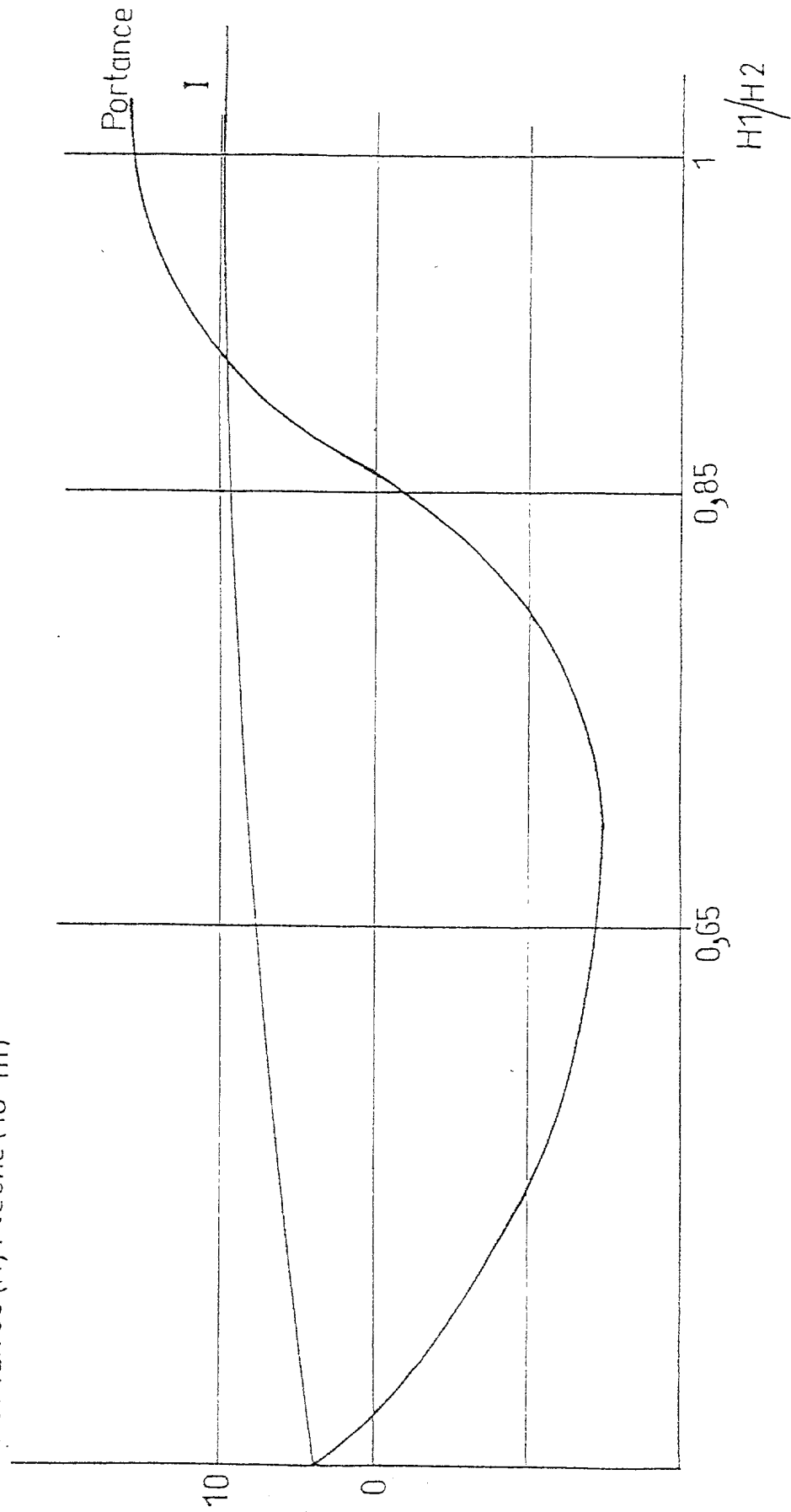


FIG.9Portance (N) Flèche (10^{-7} m)

Our Reference: VWF 0422 (VWF-514-A)

COMBINED DECLARATION AND POWER OF ATTORNEY**DECLARATION:**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

WIPER ARM SHAPED AS AN AERODYNAMIC DEFLECTOR

the specification of which (check only one item below):

☐ is attached hereto.

☐ was filed as United States application Serial No. _____ on _____, and was amended on or through _____ (if applicable).

☒ was filed as PCT international application Number PCT/FR99/02619 on 27 October 1999, and was amended under PCT Article 19 on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate or §365(a) of any PCT international application(s) which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT international application(s) having a filing date before that of the application on which priority is claimed:

Prior Foreign/PCT Application(s) and any Priority Claims Under 35 U.S.C. §119:

Priority Claimed

<u>98/13561</u>	<u>France</u>	<u>28 October 1998</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Mo/Yr Filed)	Yes	No
_____	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Mo/Yr Filed)	Yes	No

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

(Application Number) (Filing Date)

(Application Number) (Filing Date)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or §365(c) of any PCT international application(s) designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Prior U. S. Application(s) or PCT International Application(s) Designating the U.S. for Benefit Under 35 U.S.C. §120:

(Application Number) (Filing Date) (Status: patented, pending, abandoned)

(Application Number) (Filing Date) (Status: patented, pending, abandoned)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1-0
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